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ENDOWING SINGLE POLYMER CHAINS WITH ENZYME-MIMETIC ACTIVITY AND SELECTIVITY

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Abstract

Linear polymer chains can be folded / collapsed to individual, single-chain nanoparticles (SCNPs) by means of reversible[1,2] and irreversible[3] intrachain crosslinking techniques. SCNP formation is reminiscent of protein folding (see Figure 1), although current synthetic methods lack the perfection of protein folding to functional, globular enzymes.[4] Nevertheless, in recent years the classical structure−function paradigm (*i.e.*, amino acid sequence → 3D structure → function) has been revisited by taking into account that many non-structured segments of proteins, and even totally disordered proteins, play important roles in protein function.[5] In this lecture we highlight the significant added value (enzyme-like catalysis, drug binding and delivery) that can be endowed to SCNPs by taking inspiration from the functions of both ordered (native) and disordered proteins.[6] Specifically, the recently reported "concurrent" binding/folding strategy[7] opens new, promising avenues for endowing SCNPs with enzyme-mimetic activity and selectivity.[8]

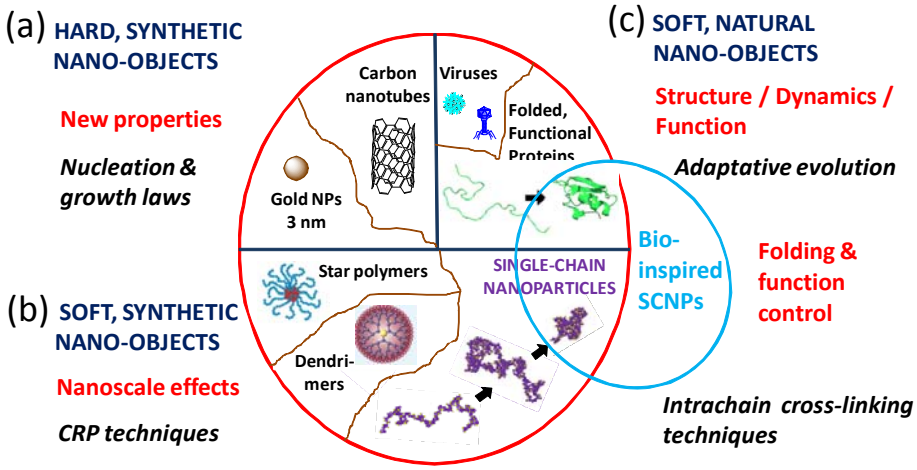

Figure 1. Illustration of hard **(a)** and soft **(b)** synthetic nano-objects. Biomimetic SCNPs can be constructed by taking inspiration from the functions of soft, natural nano-objects **(c)** and, in particular, from both native and intrinsically disordered proteins.[6]

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[1] Sanchez-Sanchez, A.; Fulton, D. A.; Pomposo, J. A. *Chem. Commun.* **2014**, *50*, 1871-1874.
[2] Sanchez-Sanchez, A.; Pomposo, J. A. *Part. Part. Syst. Charact.* **2014**, *31*, 11-23.
[3] Sanchez-Sanchez, A.; Perez-Baena, I.; Pomposo, J. A. *Molecules* **2013**, *18*, 3339-3355.
[4] Altintas, O.; Barner-Kowollik, C. *Macromol. Rapid Commun.* **2012**, *33*, 958-971.
[5] Tompa, P.; Han, K. H. *Phys. Today* **2012**, *65*, 64-65.
[6] Pomposo, J. A. *Polym. Int.* **2014**, *63*, DOI: 10.1002/pi.4671.
[7] Perez-Baena, I.; Barroso-Bujans, F.; Gasser, U.; Arbe, A.; Moreno, A. J.; Colmenero, J.; Pomposo, J. A. *ACS Macro Lett.* **2013**, *2*, 775-779.
[8] Sanchez-Sanchez, A.; Arbe, A.; Colmenero, J.; Pomposo, J. A. *ACS Macro Lett.* **2014,** *3*, Submitted.